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(71) Applicant: FUJI JUKOGYO KABUSHIKI KAISHA  
Tokyo (JP)

(72) Inventors:

- Inomoto, Yoshinobu  
Shinjuku-ku, Tokyo (JP)
- Kikuchi, Katsumi  
Shinjuku-ku, Tokyo (JP)
- Kashara, Hisao  
Shinjuku-ku, Tokyo (JP)

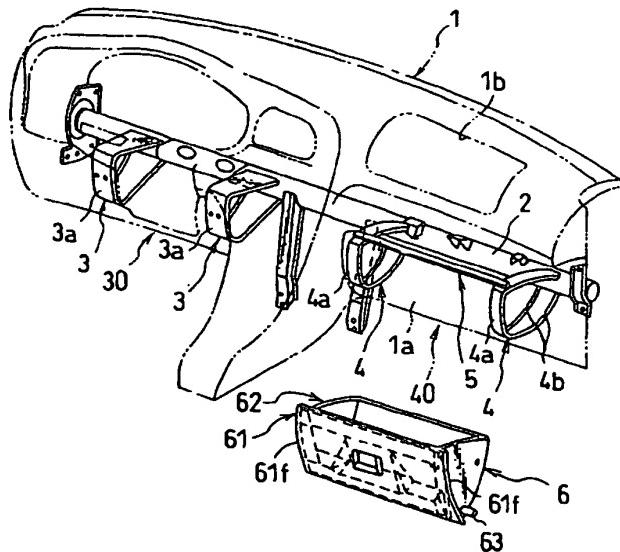
(74) Representative: W.P. Thompson & Co.  
Coopers Building,  
Church Street  
Liverpool L1 3AB (GB)

### (54) Occupant protection structure

(57) A knee guard on the passenger side of a vehicle includes left and right knee guard brackets (4) disposed along left and right side faces of a glove box (6) and secured at a front end thereof to a steering support beam (2), a connecting member (5) transversely connecting these left and right knee guard brackets (4) and a closure member (61) of the glove box (6). The closure

member (61) includes a reinforcement therein and the reinforcement has a closed cross section which extends in the widthwise direction of the vehicle. When the knees of a passenger abut against the closure member (61) of the glove box in the event of a head-on impact, the closure member is displaced forwardly and abuts against the left and right knee guard brackets (4), thereby an impact load is transmitted to the knee guard brackets.

FIG.1



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**Description****BACKGROUND OF THE INVENTION****1. Field of the invention**

**[0001]** The present invention relates to an occupant protection structure for a motor vehicle and more particularly to a knee guard structure for protecting knees of an occupant at the event of a collision.

**2. Prior art**

**[0002]** Generally, when a vehicle has a collision, an occupant is thrown forwardly. Particularly, when a safety belt or an air bag holds the upper part of the occupant's body, the lower part of the body is thrown under an instrument panel. In such a situation, the knee guard structure supports the knees of the occupant to prevent the occupant from getting in under the instrument panel. An example of the knee guard structure is disclosed in Japanese Patent Application Laid-open No. Toku-Kai-Hei 7-2035.

**[0003]** In the disclosure, the knee guard is provided at the lower part of the instrument panel so as to be located opposite to the knees of an occupant seated. On the passenger side, there is provided a glove box at the lower part of the instrument panel. A knee guard bracket is disposed on both ends of the glove box, respectively and a connecting member interconnects between both brackets. At the event of an impact, the knees of the passenger has a contact with a lid of the glove box and an impact load is inputted to the left and right knee guard brackets through the lid.

**[0004]** When the vehicle has a head-on collision, the knees of the passenger do not always abut against the knee guard orthogonally. Especially, at the event of an offset collision or an oblique collision, the knees abut against the knee guard partially or in the diagonal direction. According to the prior art, when the knees of the passenger abut against the left and right brackets through the lid of the glove box, since these brackets are disposed apart from each other, it is difficult to transfer the impact load received from the lid of the glove box uniformly to the brackets. That is, an impact energy is difficult to be absorbed efficiently.

**SUMMARY OF THE INVENTION**

**[0005]** It is an object of the present invention to provide a knee guard structure for a vehicle capable of efficiently absorbing shock without reducing the size of a glove box when knees of an occupant of the vehicle abuts against a knee guard in an event of an impact.

**[0006]** To achieve the object, the knee guard structure according to the present invention comprises left and right knee guard brackets secured to a steering support beam with a glove box between, a connecting member

transversely connecting the left and right knee guard brackets, a closure member of the glove box composed of an outer panel and an inner panel and disposed adjacent to the left and right knee guard brackets and a reinforcement provided between the inner and outer panels and having a closed cross section extended in the widthwise direction of the vehicle up to left and right end portions of the closure member.

**10 BRIEF DESCRIPTION OF THE DRAWINGS****[0007]**

- 15 Fig. 1 is an exploded perspective view of an instrument panel for a vehicle;  
Fig. 2 is an external perspective view of an instrument panel for a vehicle;  
Fig. 3a is a cross-sectional view taken along line X-X;  
20 Fig. 3b is a cross-sectional view taken along line Y-Y; and  
Fig. 4 is a plan view showing an arrangement of a knee guard bracket and a glove box.

**25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

**[0008]** Referring to Fig. 1, reference numeral denotes an instrument panel, in which a steering support beam 2 for supporting a steering column (not shown) is disposed in the widthwise direction of a vehicle. The steering support beam 2 is connected at both ends thereof with a left and right front pillar (not shown) through a bracket 2a, respectively. Further, the steering support beam 2 is connected on the driver side thereof with a pair of left and right knee guard brackets 3 and is connected on the passenger side thereof with a pair of left and right knee guard brackets 4.

**[0009]** These knee guard brackets 3, 4 have a U-shaped or C-shaped cross section and load inputting surfaces 3a, 4a, respectively, being connected by welding at the front end thereof with the steering support beam 2 so as to be located opposite to the knees of occupants seated on a driver's seat and a passenger's seat.

**[0010]** The left and right knee guard brackets 3, 3 on the driver side including the load inputting surfaces 3a, 3a are covered with the lower part of the instrument panel 1. In this case, the lower part of instrument panel 1 may be replaced with a knee pad member and the like, thus a knee guard 30 on the driver side being formed.

**[0011]** The left and right knee guard brackets 4, 4 on the passenger side are disposed respectively along the left and right sides of a glove box which will be described hereinafter. As shown in Fig. 4, a closure member 61 of a glove box 6 has left and right flange sections 61f, 61f at left and right ends thereof and the left and right flange sections 61f, 61f are opposed adjacent to the left and

right load inputting surfaces 4a, 4a, respectively. Further, a connecting member 5 fabricated of a pipe member connects the left and right knee guard brackets 4, 4 with each other. The connecting member 5 is disposed above the glove box 6 in a position not disturbing the closure and opening of the glove box 6. Further, as illustrated in Fig. 3a, there may be provided notches 4b, 4b on the knee guard brackets 4, 4 to help the buckling deformation of the knee guard brackets 4, 4. Thus, a knee guard 40 on the passenger side is constituted by the pair of the knee guard brackets 4, 4, the closure member 61 of the glove box 6 and the connecting member 5.

[0012] The glove box 6 includes the closure member 61 and a box member 62 and the left and right flange sections 61f, 61f are formed in a state of laterally overhanging from the box member 62. The glove box 6 is housed in a hollow provided under the instrument panel 1 on the passenger side and is hingedly connected to a pivot 63 so as to enable the closure and opening thereof.

[0013] As shown in Figs. 3a and 3b, the closure member 61 of the glove box 6 is constituted by an inner panel 61a and an outer panel 61b with a reinforcement 61c inside. The reinforcement has at least one closed cross section 61d extending laterally to the left and right flange sections 61f, 61f which are opposite adjacent to the load inputting surfaces 4a, 4a of the knee guard brackets 4, 4.

[0014] The load inputting surface 4a is formed into a configuration substantially agreeing with the front configuration of the flange section 61f and has a vertical length approximately equal to that of the reinforcement 61c.

[0015] Reference numeral 61e denotes a lock mechanism provided in the center of the closure member 61.

[0016] Further, there is provided an air bag system 7 in an opening 1b of the instrument panel 1 on the passenger side and it is mounted on the steering support beam 2 through a bracket. When an impact sensor (not shown) detects an impact, an air bag built in the air bag system 7 inflates and pushes to open a lid of the opening 1b. Since the operation of the air bag after deployment is well known, further detailed description is omitted.

[0017] When a head-on impact occurs, a vehicle driver abuts against the knee guard 30 on the driver seat at his or her knees and the knee guard brackets 3, 3 are subjected to the buckling deformation. During the deformation, the impact load is dispersively transmitted to the steering support beam and other vehicle body members to be absorbed therein. On the other hand, the head of the vehicle driver is held by the air bag coming on toward him or her.

[0018] Then, a passenger abuts against the closure member 61 of the glove box 6 at his or her knees and the left and right flange sections 61f, 61f contact the load inputting surfaces 4a, 4a of the knee guard brackets 4, 4. Thus, an impact load is inputted from the closure member 61 to the left and right knee guard brackets 4, 4. The knee guard brackets 4, 4 are subjected to the

buckling deformation to absorb the impact load. On the other hand, the air bag system 7 is deployed and the coming on air bag holds the head of the passenger. At this moment, even in case where the knees of the passenger obliquely abut against the closure member 61 on an offset impact, since the closure member 61 is adequately reinforced by the reinforcement 61c and the closed cross section 61d, the closure member 61 conveys the impact load uniformly to the left and right load inputting surfaces 4a, 4a without having a large deformation. Thus, the impact load inputted to the closure member 61 is surely transmitted to the left and right knee guard brackets 4, 4. Further, since the left and right knee guard brackets 4, 4 are rigidly connected with each other by the connecting member 5, these brackets can be prevented from being deformed largely in the widthwise direction of the vehicle. Hence, while the knee guard brackets 4, 4 are subjected to the buckling deformation, the impact load is dispersively transmitted from the knee guard brackets 4, 4 to the steering support beam 2 and other body members. Further, since the load inputting surface 4a is formed into a configuration substantially agreeing with the front configuration of the flange section 61f, the impact load is uniformly transmitted to the knee guard bracket 4, 4. Further, when the impact load is not so large, the deformation of the closed cross section 61d absorbs the whole impact load without dispersion to other body members.

[0019] While the presently preferred embodiment of the present invention has been shown and described, it is to be understood that this disclosure is for the purpose of illustration and that various changes and modifications may be made without departing from the scope of the invention as set forth in the appended claims.

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### Claims

1. A knee guard structure for a vehicle having a glove box and a steering support beam for protecting knees of an occupant seated on a passenger seat, comprising:

left and right knee guard brackets secured at an front end thereof to said steering support beam with said glove box between; a connecting member transversely connecting said left and right knee guard brackets; a closure member of said glove box composed of an outer panel and an inner panel and disposed adjacent to said left and right knee guard brackets respectively; and a reinforcement provided between said inner and outer panels and having at least one closed cross section extended in the widthwise direction of said vehicle up to left and right end portions of said closure member.

2. The knee guard structure according to claim 1,  
wherein

said left and right knee guard brackets have a  
load inputting surface, respectively and said  
load inputting surface is opposed adjacent to  
said left and right end portions of said closure  
member so as to receive an impact load from  
said closure member on an impact.

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3. The knee guard structure according to claim 2,  
wherein

said load inputting surface is formed into a con-  
figuration agreeing with said end portions.

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4. The knee guard structure according to claim 1,  
wherein said left and right knee guard brackets are  
formed into a loop-shape and both ends thereof are  
connected with said steering support beam.

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FIG.1

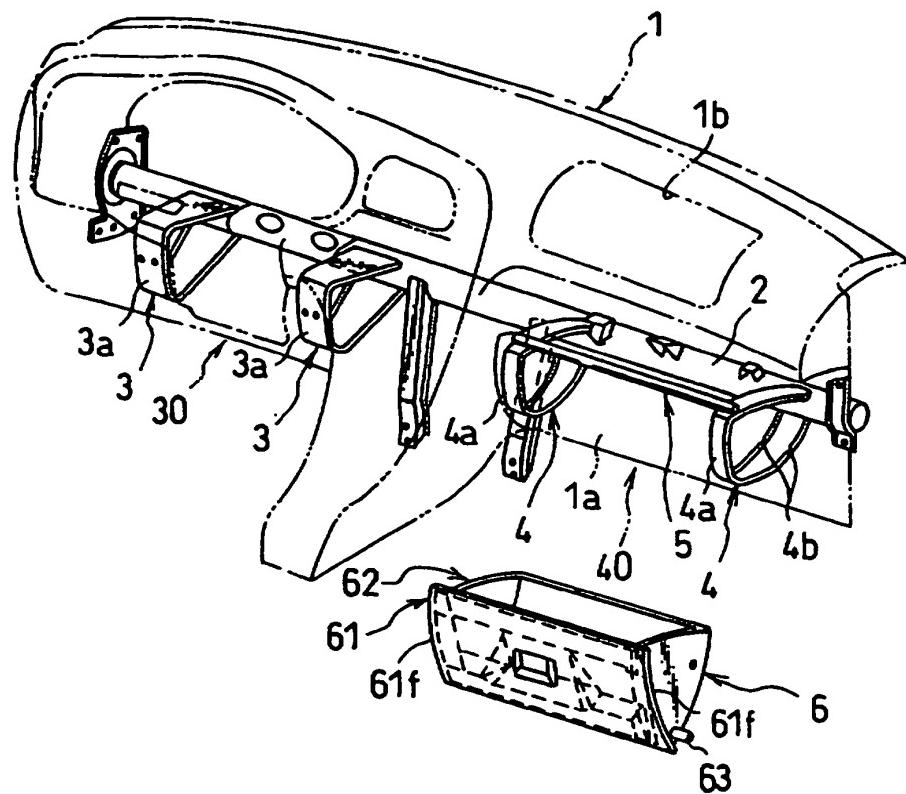


FIG.2

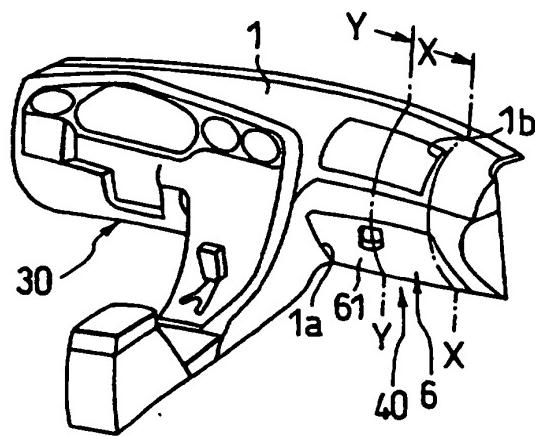


FIG.3a

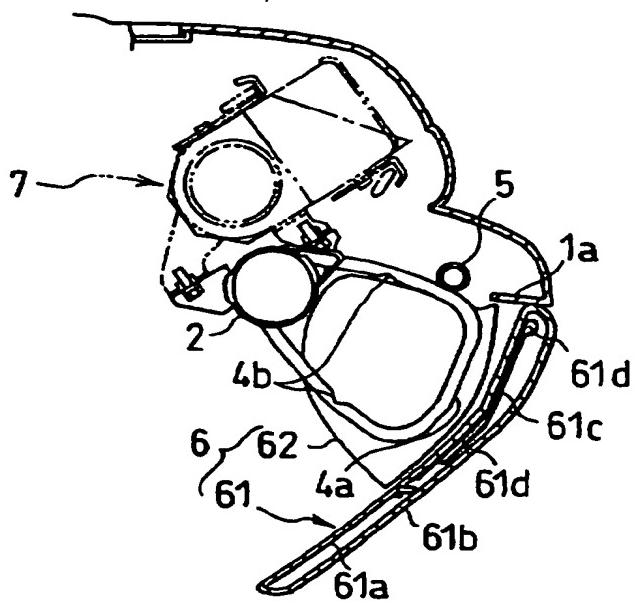


FIG.3b

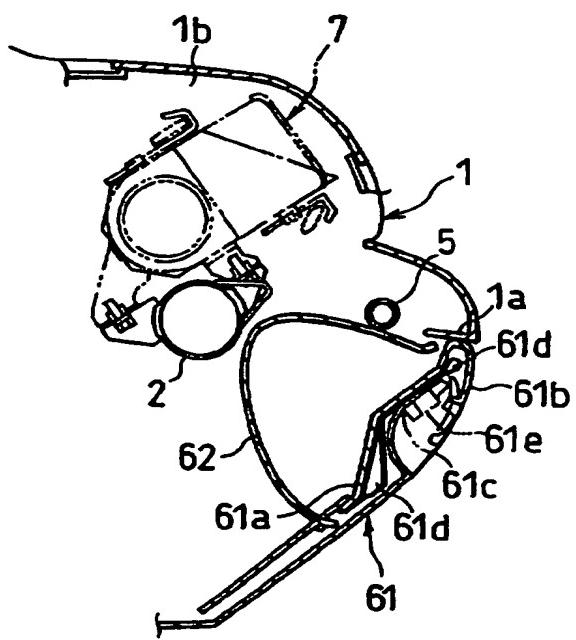
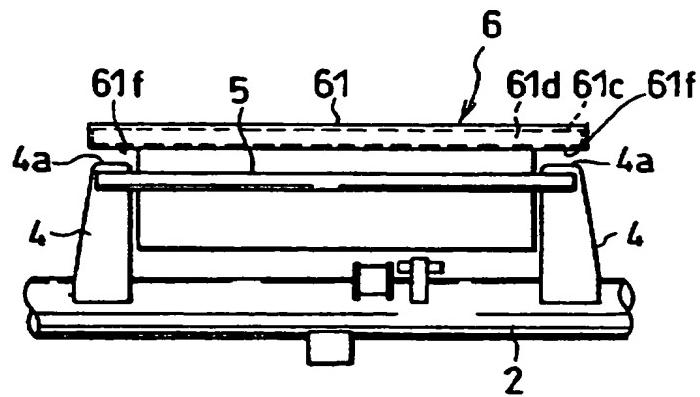


FIG.4





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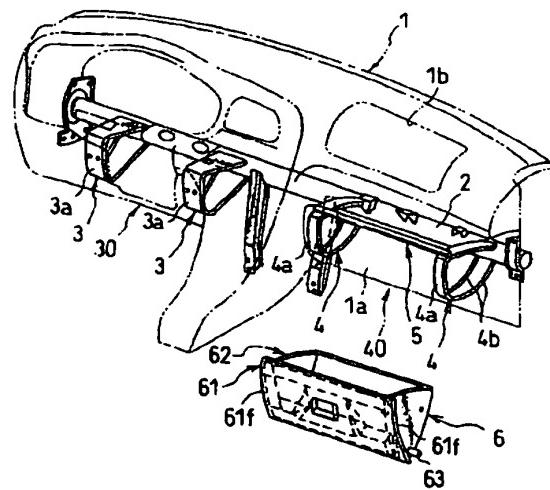
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FIG. 1



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## EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 3822

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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Y	US 4 662 649 A (IKEDA HIDEKAZU ET AL) 5 May 1987 (1987-05-05) * column 2, line 26-34 * * column 3, line 38-46 * * figures 2,3 *	1-3	
Y	US 5 190 314 A (TAKASUGI SEIJI) 2 March 1993 (1993-03-02) * column 3, line 42 - column 4, line 31 * * figures 3-5 *	1	
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<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
MUNICH	4 November 2002	Adacker, J	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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